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10/087,556	03/01/2002	Katsumi Yamaguchi	TI-31471	2191
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TEXAS INSTRUMENTS INCORPORATED P O BOX 655474, M/S 3999 DALLAS, TX 75265			IM, JUNGHWA M	
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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Paper No. 15

Application Number: 10/087,556  
Filing Date: March 01, 2002  
Appellant(s): YAMAGUCHI ET AL.

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Jay M. Cantor  
For Appellant

**EXAMINER'S ANSWER**

This is in response to the Supplemental appeal brief filed February 23, 2004.

**(1) *Real Party in Interest***

A statement identifying the real party in interest is contained in the brief.

**(2) *Related Appeals and Interferences***

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

**(3) *Status of Claims***

The statement of the status of the claims contained in the brief is correct.

**(4) *Status of Amendments After Final***

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

**(5) *Summary of Invention***

The summary of invention contained in the brief is correct.

**(6) *Issues***

The appellant's statement of the issues in the brief is correct.

**(7) *Grouping of Claims***

The rejection of claims 1-6 and 10-22 stand or fall together because appellant's brief does not include a statement that this grouping of claims does not stand or fall together and reasons in support thereof. See 37 CFR 1.192(c)(7).

**(8) *Claims Appealed***

The copy of the appealed claims contained in the Appendix to the brief is correct.

**(9) *Prior Art of Record***

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6,153,938	Kanda et al.	11-2000
5,874,780	Murakami	02-1999
6,426,556	Lin	07-2002

**(10) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

Claims 1, 3-6, 9, 11, 12 and 18-22 are rejected under 35 U.S.C. 102(e) as being anticipated by Kanda et al. (US 6,153,938), hereinafter Kanda.

Regarding claims 1 and 3-6, Fig. 1C of Kanda shows a semiconductor device comprising:  
a contact pad (col. 6, lines 15-18) on a semiconductor substrate 1;  
a conductive bump 2 (gold; col. 5, line 43) on the contact pad, the bump comprising a coaxially-aligned circular bodies having different cross-sectional dimensions, said bodies at the top of said stack having smaller cross-sectional dimensions.

Regarding claim 9, Fig. 1C of Kanda shows bodies at the top of said stack have a smaller height than lower bodies in said stack.

Regarding claim 11, Fig. 1C of Kanda shows the semiconductor device further

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comprising a passivation film 9 around said contact pad.

Regarding claim 12, Fig. 1C of Kanda shows the sides of the contact pad is on an insulating film 9 on said semiconductor substrate.

Regarding claim 18, Fig. 1C of Kanda shows a semiconductor device, comprising:  
a semiconductor substrate 1, a contact pad (col. 6, lines 15-18) on said semiconductor substrate;

a first bump (a larger body of the bump 2) on said contact pad; a smaller second bump on said first bump, said second bump coaxially aligned with said first bump and having a substantially flat peak plane (col. 6, lines 7-13); a printed circuit board 6, wherein said semiconductor substrate is mounted over said printed circuit board such that said contact pad and said first and second bumps are aligned with a conductive film 7 on said printed circuit board.

Regarding claim 19, Fig. 1C of Kanda shows the semiconductor device further comprising a passivation film 9 around said contact pad.

Regarding claim 20, Fig. 1C of Kanda shows the first bump has a first height dimension and the second bump has a second height dimension, wherein the first height dimension is greater than the second height dimension.

Regarding claim 21, Fig. 1C of Kanda shows the first and second bumps are circular.

Regarding claim 22, Kanda discloses that the bumps are made of gold (co. 5, lines 43-44).

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The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kanda in view of Murakami (US 5,874,780).

Regarding claim 2, Kanda shows substantially the entire claimed structure except “the uppermost body in said stacked has a flat peak plane.” Fig. 7C of Murakami shows a semiconductor device wherein the uppermost portion (body) of the bump 107 in the stack has a flat peak plane. It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teaching of Murakami to of Kanda’s bump structure in order to form a flat top surface of the uppermost body to improve the contact between the chip and the corresponding substrate.

Claims 10, 12 and 13-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kanda in view of Lin (US 6,426,556).

Regarding claims 10 and 12, Fig. 1C of Kanda shows substantially the entire claimed device except a barrier layer and an insulation layer. However, Fig. 15 of Lin shows a gold bump 35 formed on a contact pad 24 on an insulating film 29 on a substrate 10 with a barrier formation 33, 34 between the contact pad and the bump. Also see the respective portions of the specification such as col. 3, lines 11-28.

It would have been obvious to one of ordinary skill in the art at the time of the invention

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to incorporate the teaching of Lin to the device of Kanda in order to form an barrier layer between a contact pad and a bump since a barrier layer between a contact pad and a bump serves to prevent diffusion of solder material into underlying layers. In addition, it would have been obvious to one of ordinary skill in the art at the time of the invention to add an insulating layer on a substrate of Kanda's device with Lin's teaching in order to alleviate a noise interference through the substrate to a conductive pad.

Regarding claim 13, Fig. 1C of shows Kanda a semiconductor device, comprising:  
a contact pad (col. 6, lines 15-18) on a semiconductor substrate 1;  
a first bump (a major portion of the bump 2) having a first cross-sectional dimension;  
a second bump (a tail portion of the bump 2) on and coaxially aligned with said first bump, said second bump having a cross-sectional dimension smaller than said first cross-sectional dimension. Fig. 1C of Kanda fails to shows a barrier layer on the contact pad and a the contact pad formation on the insulating layer. However, Fig. 15 of Lin shows a gold bump (35) formation on a contact pad 24 with a barrier layer 33, 34 in between while a contact pad is formed on a dielectric layer 29 on a substrate 10.

It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teaching of Lin to the device of Kanda in order to form an barrier layer between a contact pad and a bump since a barrier layer between a contact pad and a bump serves to prevent diffusion of solder material into underlying layers. In addition, it would have been obvious to one of ordinary skill in the art at the time of the invention to add an insulating layer on a substrate of Kanda's device with Lin's teaching in order to alleviate a noise interference through the substrate to a conductive pad.

Regarding claims 14-17, Fig. 1C of Kanda shows the semiconductor device further comprising a passivation film 9 around said contact pad, and two circular bumps (gold; col. 5, line 43) while the height of the first bump is greater than the height of the second bump.

**(11) Response to Argument**

**Issue 1**

Regarding claim 1, Appellant argues that “Kanda does not teach a stack of bodies.” This argument is clearly inconsistent with the disclosure of Kanda. Irrespective of how bump 2 of Kanda is formed, he clearly shows in Figure 1C “bump [2] comprising a coaxially-aligned stack of bodies having different cross-sectional dimensions.” This is true irrespective of whether bump 2 is formed from two separate pieces of body or from a single piece of body.

At this time, it should be noted Appellant’s “stack of bodies” is formed of same material, therefore, without knowing how the bump is formed the only way to determine a “stack of bodies” is by their dimension. This is how the claims are being analyzed with respect to the disclosure of Kanda.

The honorable members of the Board are requested to analyzed the claims similarly since the rejected claims 1-6 and 9-22 are directed to an apparatus an not to a method of making a bump.

Regarding claim 18, since “a smaller second bump on said first bump, said second bump coaxially aligned with said first bump” corresponds to “stack of bodies” in claim 1, issue of claim 18 is identical to that of claim 1.



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***Issue 2***

Rejection of claim 2 under 35 U.S.C. 103(a) over Kanda in view of Murakami should be maintained for the reasons stated claim 1.

***Issue 3***

Rejection of claim 10, 12, and 13-17 under 35 U.S.C. 103(a) over Kanda in view of Lin should be maintained for the reasons stated claim 1.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Junghwa M. Im  
May 13, 2004

Conferees  
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